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(54) Character broadcast receiver

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(72) Inventor Fukuzaki, Kazuhiro
c/o Sharp Corp., 22-22 Nagaike-cho, Abeno-ku, Osaka-shi

(72) Inventor Takemura, Kinya
c/o Sharp Corp., 22-22 Nagaike-cho, Abeno-ku, Osaka-shi

(72) Inventor Kuki, Masaru
c/o Sharp Corp., 22-22 Nagaike-cho, Abeno-ku, Osaka-shi

(21) Applicant Sharp Corp.
22-22 Nagaike-cho, Abeno-ku, Osaka-shi

(74) Agent Patent Attorney Fukushi, Aihiko

Specifications

1. Title of the Invention
   Character broadcast receiver
2. Scope of Patent Claims
   1. A character broadcast receiver that receives character signals of characters, graphical shapes, etc., multiplexed and transmitted in a television signal's vertical blanking interval, stores these character signals in memory, reads them therefrom and displays them, distinguished in that:

      it is provided with memory capable of storing multiple screens' worth of character pattern information and color information of the character signals (referred to as character information);

      it comprises an input means that, in accordance with the user's selection, fixes character information stored in memory such that it will not be updated by newly received character information, and inputs this newly received character information so as to control it such that such that it will be stored in the next memory; and an input means for reading this fixed character information from memory and inputting it so as to control in order to display it;

      the user can select arbitrary received character information and fix it in memory through input of the input means, or read out and display this fixed character information as required through input of the input means.
3. Detailed Description of the Invention

The present invention relates to the memory function device that stores successively transmitted incoming character information in a character broadcast receiver that receives character signals of characters, symbols, graphical shapes, etc. that are time division multiplexed and transmitted in unused regions of a television signal's vertical retrace interval or the like, stores them in memory, and then reads them from said memory and overlays them onto a portion of the video signal of said television signal or displays them alone on the television screen separately from the video signal.

Character broadcasts use a system whereby one screen's worth of character broadcast is transmitted by dividing the character information into an appropriate number of portions, so to display the character information on the television screen on the reception side, it is necessary to store this information for a time in memory in accordance with the control signals among the character signals.

Therefore, the character and graphical shape data (hereinafter referred to as character data) and the color data (hereinafter referred to as color data) relating to a program selected by the viewer is selected from the incoming character signals at the character broadcast receiver and stored in character memory and color memory respectively, after which the character data and color data are successively read out in the display interval and displayed on the television screen.

In conventional character broadcast receivers, the character memory and color memory each hold only one screen's worth, so the viewer had to wait a substantial amount of time until the desired program arrived. Furthermore, even if there was character information that one wanted to save and view later, when a new program or page is received (in character broadcasts, a program may span across multiple pages), the earlier character information would be deleted, so it was not possible to save character information for later. Moreover, comparison with other programs or character information, comparison with character information of another broadcast station or the like was not immediately possible.

In this connection, in view of the above points, the present invention has the objective of providing a character broadcast receiver that reduces the psychological burden in the time spent waiting until a desired program arrives, allows the user to store character information that he wishes to save for later, and makes it possible to immediately display character information of other programs and character information of other stations, and is distinguished in that it comprises multiple screens of character memory and color memory that store character information.

Below, as an example of embodiment of the character broadcast receiver of the present invention, an example is described that in particular has three screens' worth of character memory and color memory.

Figure 1 shows a block diagram of the essential points of an example of embodiment; Figure 2 shows a detailed block diagram of the character reception circuit unit of the same; and Figure 3 shows a detailed block diagram of the character memory and color memory of the same, and their peripheral circuits.

In Figure 1, a television signal containing a character signal inputted from an antenna 1 enters and is tuned by a tuner 2, and is further guided to an intermediate frequency/detection circuit 3 to undergo intermediate frequency amplification and vide detection, and is then inputted into a TV reception circuit 4 and a character reception circuit 8.

The TV reception circuit 4 combines all the circuits that perform common TV functions. A portion of the audio circuits is not illustrated.

The character reception circuit 8, as described later, extracts the character signal, discriminates and processes the control signals in this character signal to extract the character pattern data and color data and stores them in the respective memories, after which they are read out and composited and outputted as R (red), G (green) and B (blue) signals and fed to a mixing circuit 5.

At this mixing circuit 5, these R, G and B signals are overlaid onto the television video signal from the TV reception circuit 4 or are displayed alone as character information on the CRT 6.

The character broadcast receiver comprises, separately from the TV tuning buttons, character broadcast control buttons 9, signals from which are also inputted into the character reception circuit 8. A tuner voltage control circuit 7 is added for implementing TV channel tuning via signals from the character reception circuit 8.

This character reception circuit 8 is described next while referring to Figure 2.

The television video signal inputted from the intermediate frequency/detection circuit 3 is inputted into the character signal extraction circuit 10, where character signals are extracted and written into buffer memory 10. Extracted character signals are passed into a clock generating circuit 12, where clock signals necessary for writing character signals into buffer memory 10 and the like are generated in accordance with the sync signals in these character signals.

Moreover, the television video signal is also inputted into a sync separation circuit 13, where the sync signals are separated and further inputted into a control circuit 14. In this control circuit 14, the various types of necessary signals are generated.

Character signals written into buffer memory 11 are sent to a microcomputer (hereinafter referred to as CPU) 28 via a data bus 22, and the CPU 28 transfers character data from the character signals to

the character memory A15 and color memory A16 only when the character broadcast program inputted by means of control buttons 9 and the program code in the character signals match.

Here, in character broadcast receivers proposed in the prior art, there was only one screen's worth of character memory and color memory (A15 and A'16 only), while the present invention, in addition to this one screen A (A15, A'16), comprises character memory B17, color memory B'18, character memory C19, color memory C'20, etc., as shown by the dashed line in Figure 2, which allows memory operations and preset operations as described below, which were not possible with devices proposed in the prior art.

Character information written into character memory and color memory is assigned a read address by the control circuit 14, and is read out in a set display interval and sent to a character and color mixing circuit 21. The clock signals for this reading are obtained from the clock generating circuit 12'.

At the character and color mixing circuit 21, the character data and color data are mixed and outputted as R (red), G (green) and B (blue) signals.

The operation of the CPU 3 is controlled by commands provided from a control ROM 27. For example, when character data is to be written into character memory A15, the address of character memory A15 is specified by the CPU 28 via address bus 24. The control circuit 14 receives signals from this address bus 24, interprets those signals as designating the character memory A15, and outputs a memory select signal SA. Character memory A15 is thereby selected, and character data is transferred by the CPU 28 from the control RAM 26 via a data bus to the character memory A15. Thus, character data from the buffer memory 11 is stored temporarily in control RAM 26, and transferred to the character memory. Transfer of color data to the color memory is performed in the same manner as the above transfer of character data, via the data bus 22. Of course, when writing to the character memory and color memory, the character memory and color memory are set to a write state by means of a read/write signal (R/W signal) via a control bus 23.

Furthermore, to perform reading of character data and color data from the character memory and color memory, the address of the character memory and color memory is designated via the address bus 22, the character memory and color memory are designated by memory select signals from the control circuit, and the R/W signal is put into a read state.

Furthermore, when the character memory and color memory need to be erased, for instance when there is a clear memory input as described below, this input is interpreted by the CPU to order the control circuit 14 to output an erase signal SE. Since the erase signal SE is low level, gates 31, 32, 33 and 34 block the character data and R/W signal and color data and R/W signal as shown in Figure 3. As a result, the output SMW and SIW of the gate 32 and gate 34 goes to low level and the character memory and color memory enter a write state, while the output (zero) of gates 31 and 33 is inputted, and thus the character memory and color memory in question are erased. When no erase signal SE is provided, the gates 31, 32, 33 and 34 remain open, so character data and R/W signal and color data and R/W signal pass as-is through the gates 31, 32, 33 and 34 and are fed to the character memory and color memory as SMD, SMW, SID and SIW.

When character data is written into buffer memory 12, it is converted to 8-bit parallel bits. This is because the data bus 22 is made up of eight bits, and this is favorable for parallel data processing. Thus, after the buffer memory 11, all character data is transferred as 8-bit parallel data. On the other hand, color data is made up of 4-bit color codes, so it is likewise transmitted as parallel data using 4 bits of the data bus. These character data and color data are mixed at aforementioned character and color mixing circuit 21 and turned into R, G, B signals, at which time the parallel data is turned back into the original serial data.

Signals from the control buttons 9 are sent via I/O 25 and data bus 22 to the CPU 28, where commands such as program selection from the viewer are interpreted and processing is performed based on those commands.

Figure 4 shows an explanatory drawing of the control panel where the control buttons 9 are mounted.

K_1 is a key group consisting of numeric keys and a # key, which has been provided in character broadcast receivers proposed in the prior art. In addition to this key group, the present invention comprises keys K_2 through K_{10}, K_A through K_C, etc. for memory operations, preset operations and the

like.

Keys K_2, K_3 and K_4 are memory operation designation, recall memory (RM), and clear memory (CM) keys. Keys K_5 and K_6 are preset operation designation and preset cancellation keys; keys K_7, K_8 and K_9 are for designating the type of preset and are used to designated page, program and broadcast station. The character signal multiplexed in 20H/283H of the television video signal consists of control codes and page control codes, and color code data or character pattern data. In cases where a signal to indicate pages of a program is included in this character signal, a key K_7 is provided to enable designation of pages in preset operation, but when no such signal to indicate pages is included, the K_7 key and associated functions can of course be omitted.

Keys K_A, K_B and K_C designate memories A and A', B and B', and C and C', and are used for displaying the content thereof on the TV screen.

Key K_{10} is for resetting the operation, and D is for displaying the program number.

In the above example of embodiment, the following three types of operation are executed in accordance with the viewer's selection: (I) normal operation, (II) memory operation, (III) preset operation. Figure 5 shows a flow chart that explains these operations. In this drawing, SX corresponds to one of memory select signals SA, SB and SC, so X can be any one of A, B or C, while R/W corresponds to the memory write signal and SE to the memory erase signal.

When power is switched on, SX is set equal to SA, and memories A and A' are initially selected (hereinafter, both memories are referred to together as memory A).

Next, the operation selected by the viewer is executed.

When the memory key K_2, recall memory key K_3, clear memory key K_4 or preset key K_5 is selected, the corresponding operation is executed; otherwise, normal operation is assumed to be selected. The determination of whether normal operation is on can be carried out by raising a flag in response to a key scan of K_2, K_3, K_4 and K_5 and then checking this flag.

When this determination is Yes, the operation is as follows.

(I) Normal operation

The program selected by the viewer using the ten-key (K_1) is read in, and when the number of the received character signal matches this read in program, the character data and color data are read into the character signal in character memory A and color memory A' (hereinafter, both memories are together referred to as A) by reading them into memory X (currently, X = A). At this time, of the memory select signals SA, SB and SC, only SA is active. Thus, memories other than memory A, i.e. memory B and memory C, do not operate.

The content of this memory X (currently, X = A) is read out in the display interval and displayed.

Then it is checked by key scan if the memory, RM, CM or preset key K_2, K_3, K_4 or K_5 has been selected, and if any of them has been selected, a flag is raised and it is determined that operation other than normal operation has been selected.

When an erase signal SE is inputted, the content of character memory and color memory is all erased. That is, when the erase signal SE goes to low level, the AND gates 31 and 33 cause the character data and color data to become low level, "0" is inputted to the data input terminals of character memory and color memory, and the AND gates 32 and 34 cause the read/write signal (hereinafter referred to as R/W signal) SMW and SI of character memory and color memory to go to low level, putting them into write mode. In the above state, the content of the memory address signal SADR is successively incremented, and thus the content of the character memory and color memory is erased.

In this normal operation, every time a character signal program matching the selected program is received, the character information in the newly received character signal is read in to replace the previous character information, so it is constantly updated, and is then displayed.

When there is character information that the viewer wants to save for later, a memory operation is executed by pressing the memory key K_2, saving the character information displayed at the time for later and allowing it to be redisplayed whenever desired.

(II) Memory operation

When the memory key K_2 is activated, the "Memory?" decision becomes Yes, and memory X protect is executed. That is, when the memory key K_2 is depressed, in order to preserve the content of

memory X, e.g. memory A, the writing of data into memory A is blocked. That is, the character memory R/W signal and color memory R/W signal are constantly held in read mode so long as memory A is involved. In read mode, the character memory R/W signal and color memory R/W signal are at a high level.

Next, memory type increment X = X + 1 is executed, thus setting it to B when memory A is write-protected as described above. Similarly, when memory B or C is write-protected, it would be set to memory C or A.

If the memory set in this manner is memory B, normal operation will be executed using memory B.

When one wishes to redisplay character information stored in this memory A, by pressing the recall memory key K_3 followed by the memory select key K_A, the content of memory A will be immediately read out and displayed on the television screen. That is, when key K_3 is depressed, memory X, that is the currently operating memory X, e.g. memory B, is saved. Then it is examined by means of key scan (A, B, C) whether the depressed key was K_A, K_B or K_C and the result is read in (memory type read). Then display of memory content corresponding to the depressed key is executed. For example, if the key K_A was depressed, the content of memory A is read out and displayed on the television screen.

The return from this operation to normal operation is executed by depressing the return key K_{10}, whereby the decision of "Return key input?" becomes Yes. Here, a "memory X save call" is performed, the content of memory A is retained, and normal operation is conducted by calling and using memory X, i.e. memory B.

Furthermore, when there is new character information that one wishes to save for later, by depressing the memory key K_2 again, that character information will be retained, this time in memory B. The operation here is the same as in the case of memory A as described above. Next, if key K_3 is depressed followed by key K_B, the content of memory B will be immediately displayed on the television screen.

In this way, using the memories A, B and C, it becomes possible to hold three screens' worth of character information at once, the content of which can be immediately displayed on the television screen when desired by operating the key K_3 and key K_A, K_B or K_C. Here, the memory select signal SA, SB or SC becomes active (enters operating mode) when one operates key K_A, K_B or K_C respectively.

Next, when one wishes to erase stored character information, by depressing the clear memory key K_4 followed by key K_A, the character information held in memory A will be erased. Here, the erase signal SE and memory select signal SA become active at the same time, erasing the content of memory A. The same operation is performed for memory B and memory C. Here, according to the "memory X save call", memory X that was in operation when key K_4 was pressed is called, and normal operation is performed using this memory X.

Next, the viewer can save programs that he wants to view in the respective memories; by using the keys K_A, K_B and K_C, the saved program's character information is immediately displayed on the television screen.

(III) Preset operation

A preset of a program one wants to see is designated in page units, program units and broadcast station units.

When one wants to make a present in page units, the desired program is selected with the ten-key K_1, and then the preset key K_5 is pressed first, followed by the page key K_7, to specify that this is a page unit preset. In this case, first the program selected with the ten-key K_1 will be received under normal operation, and then, since the preset key K_5 is not one of the memory key K_2, recall memory key K_3 or clear memory key K_4, preset operation is entered, and the subsequent page key K_7 specifies by key scan (page, program, broadcast station) that this is a page unit preset. Of course, if the program key K_8 or broadcast station key K_9 is pressed instead of the page key K_7, that would specify that the preset is in program units or broadcast station units.

Thereafter, following the K_A key, one enters the page number one wishes to preset using the ten-key K_1, e.g. "2##" for the second page. At this time, "2" will be displayed on the display D. Of course, the character information of the second page of the selected program will be stored in memory A and displayed on the television screen.

Next, when one wishes to store the third page of the same program in memory B, it suffices to

sequentially press the preset key K_5, the page key K_7 and the key K_B, and then enter "3##" using the ten-key K_1. The above operation will store the character information of the second page in memory A and the character information of the third page in memory B. Here, when the character information of the second page arrives, the SA signal becomes active, and character information is written into memory A. Then when the character information of the third page arrives, the SB signal becomes active and character information is written into memory B. When one wishes to display this character information, by pressing key K_A or key K_B, the second or third page of character information will be displayed on the television screen. Here, the channel number of the selected program is displayed on the LED display D. If the return key K_{10} is pressed following the above operation, normal operation will be performed using memory C while continuing preset operation in memory A and memory B. By pressing the preset cancel key K_6, preset operation is stopped and normal operation is again performed using memory A.

To make a preset in program units, one presses the preset key K_5 followed by the program key K_8 to specify that the preset is in program units. Then one presses the key K_A and then enters the preset program using the ten-key K_1, e.g. "10##" if it is channel 10 (pressing the # key twice to enter ## signifies completion of preset-related input). As a result, the character information of channel 10 will be stored in memory A and displayed on the television screen. Different programs can be preset in the same manner in memory B and memory C, and by pressing key K_A, key K_B or key K_C, the memory select signal SA, SB or SC will become active and character information read out from the corresponding memory will be displayed. When making a preset, if the page number is entered following the channel number, one can specify not only the program but also the page. For example, if one presses "10#2##", the second page of channel 10 will be preset. If only "10##" is entered, the character information of all pages relating to that program would be displayed one after another as they arrived. The operation upon pressing the return key K_{10} and the preset cancel key K_6 is the same as in the page unit case discussed above.

In broadcast station unit preset operation, the viewer can set character broadcast programs of different broadcast stations into respective memories. For example, when one wishes to preset programs of NHK (Ch 2) and Asahi Hoso (Ch 6), one presses the preset key K_6 followed by the broadcast station key K_9, specifying that this is a preset in broadcast station units. Subsequently, one presses the key K_A and enters "2#10##" using the ten-key K_1 to specify the NHK channel 10. Then one presses the key K_B and enters "6#20##" using the ten-key K_1 to specify channel 20 of Asahi Hoso. By doing this, the NHK character broadcast channel 10 will be stored in memory A and the Asahi Hoso character broadcast channel 20 will be stored in memory B. Here, the character broadcast receiver controls the tuner voltage and first receives the radio wave of NHK, receiving the character signal of character broadcast channel 10 therein and storing its content in memory A; then it changes the tuner voltage to receive the radio wave of Asahi Hoso, receiving the character broadcast channel 20 and storing its content in memory B, and then again receives the radio wave of NHK, repeating the operation. When one wishes to display the preset character information, by pressing the key K_A or K_B, the content of memory A or memory B will be immediately displayed on the television screen 8. When making the preset, if one enters the broadcast station channel and program channel followed by the page number, the page of the program can also be specified. Or if one inputs just the broadcast station channel, the character information of all programs and all pages of that broadcast station will be successively received and displayed.

It is also possible to perform memory operation and preset operation simultaneously; for example, one can use memory A for memory operation and the remaining memory B and memory C for preset operation. In this case, the memory operation is prioritized. This is in order to protect character information retained by the memory operation.

Moreover, in memory operation and preset operation, it is possible to display not just the content of one memory at a time, but to display all three simultaneously. Figure 6 shows a display example thereof. Here, the memory read clock signal frequency is made threefold to display the character information of memories A, B and C in sequence from the left of the screen. The memory select signals SA, SB and SC respectively become active in the A, B and C intervals shown in Figure 7.

While the above was an example of embodiment for the case where the character broadcast

transmission system uses pattern transmission, the invention can also be applied in the case of code transmission. In that case, character data is stored as code, so memory capacity can be greatly reduced.

With the character broadcast receiver according to the present invention, while using a given memory for conventional reception operation as proposed in the prior art, the other memories can be used for purposes other than conventional reception operation, such as for storing desired character information or for storage required for desired preset operation or the like, thus allowing the receiver to be used for memory operation and preset operation, which makes it possible to display the content of another memory while waiting for a desired program to arrive, which should be noted for its practical effects, such as being useful in reducing the psychological burden of nervously waiting and wondering when one's desired program will finally arrive.

4. Brief Description of the Drawings

Figure 1 shows a block diagram of the essential points of an example of embodiment of the character broadcast receiver of the present invention. Figure 2 shows a specific block diagram thereof. Figure 3 shows a block diagram of the essential parts thereof. Figure 4 shows a front view of the front panel of the same. Figure 5 shows a flow chart explaining the operation thereof. Figure 6 and Figure 7 show drawings that explain the television screen and horizontal scanning interval in another example of the operation thereof.

8: character receiver circuit; 9: control button; 10: character signal extraction circuit; 11: buffer memory; 15, 17 and 19: character memory; 16, 18 and 20: color memory; 28: microcomputer; 21: character and color mixing circuit.

Agent: Patent Attorney Fukushi, Aihiko

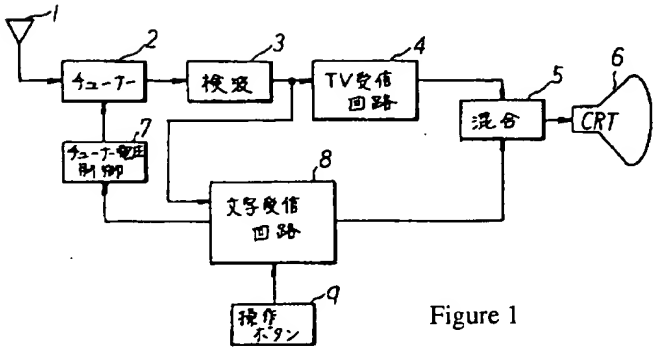

Figure 1

[captions]
2: Tuner
3: Detection
4: TV reception circuit
5: Mixing
7: Tuner voltage control
8: Character reception circuit
9: Control buttons

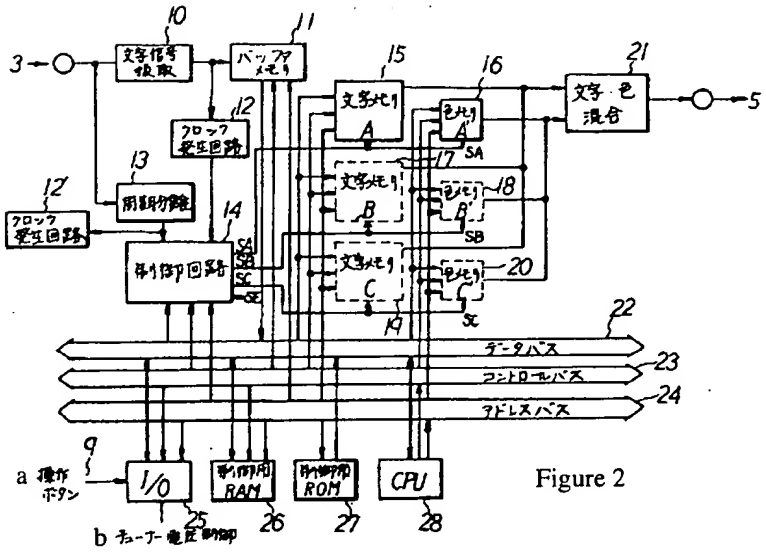

Figure 2

[captions]
a: Control buttons
b: Tuner voltage control
10: Character signal extraction
11: Buffer memory
12: Clock generating circuit
13: Sync separation
14: Control circuit
15: Character memory A
16: Color memory A'
17: Character memory B
18: Color memory B'
19: Character memory C
20: Color memory C'
21: Character/color mixing
22: Data bus
23: Control bus
24: Address bus
26: Control RAM
27: Control ROM

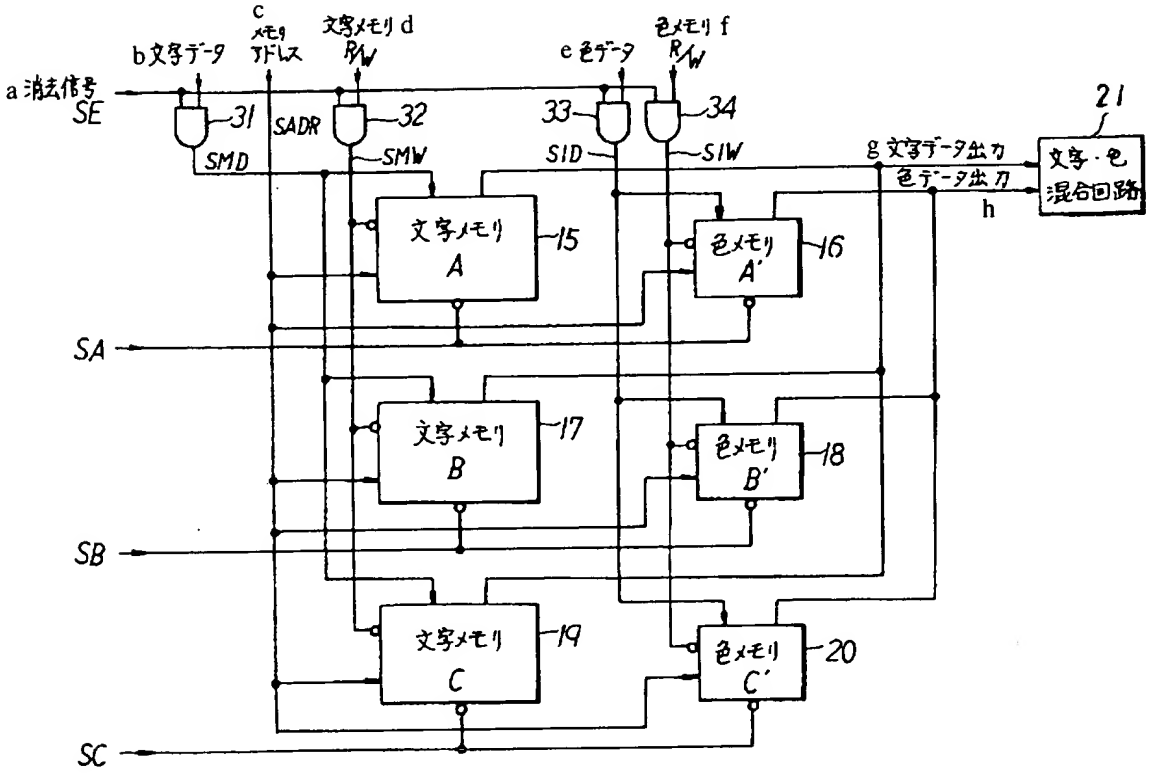

Figure 3

[captions]
a: Erase signal
b: Character data
c: Memory address
d: Character memory R/W
e: Color data
f: Color memory R/W
g: Character data output
h: Color data output

15: Character memory A
16: Color memory A'
17: Character memory B
18: Color memory B'
19: Character memory C
20: Color memory C'
21: Character/color mixing circuit

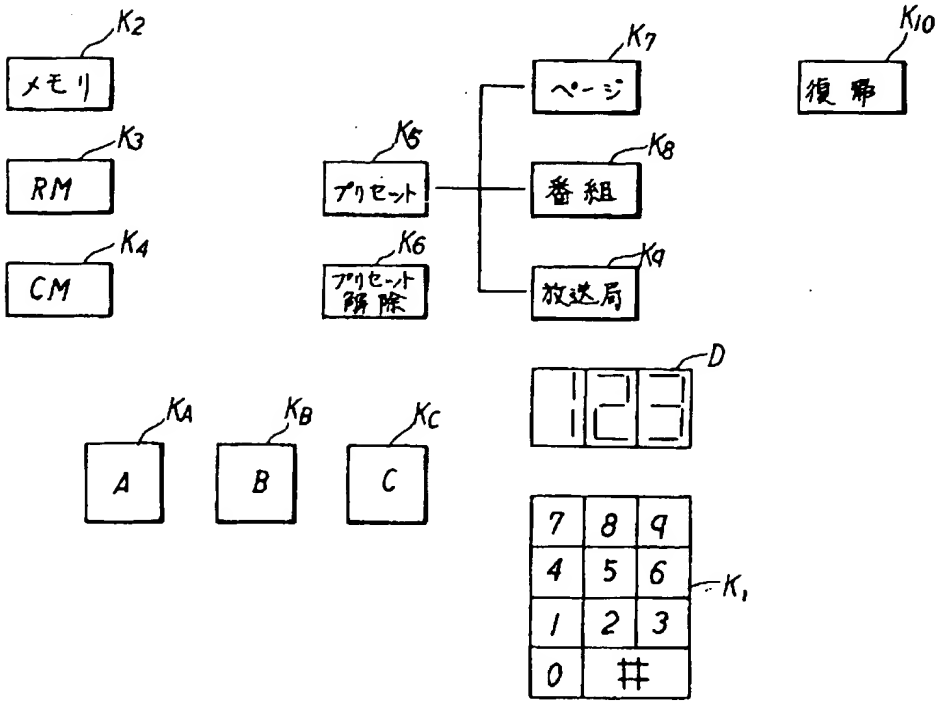

Figure 4

[captions]
K2: Memory
K5: Preset
K6: Preset cancel
K7: Page
K8: Program
K9: Broadcast station
K10: Return

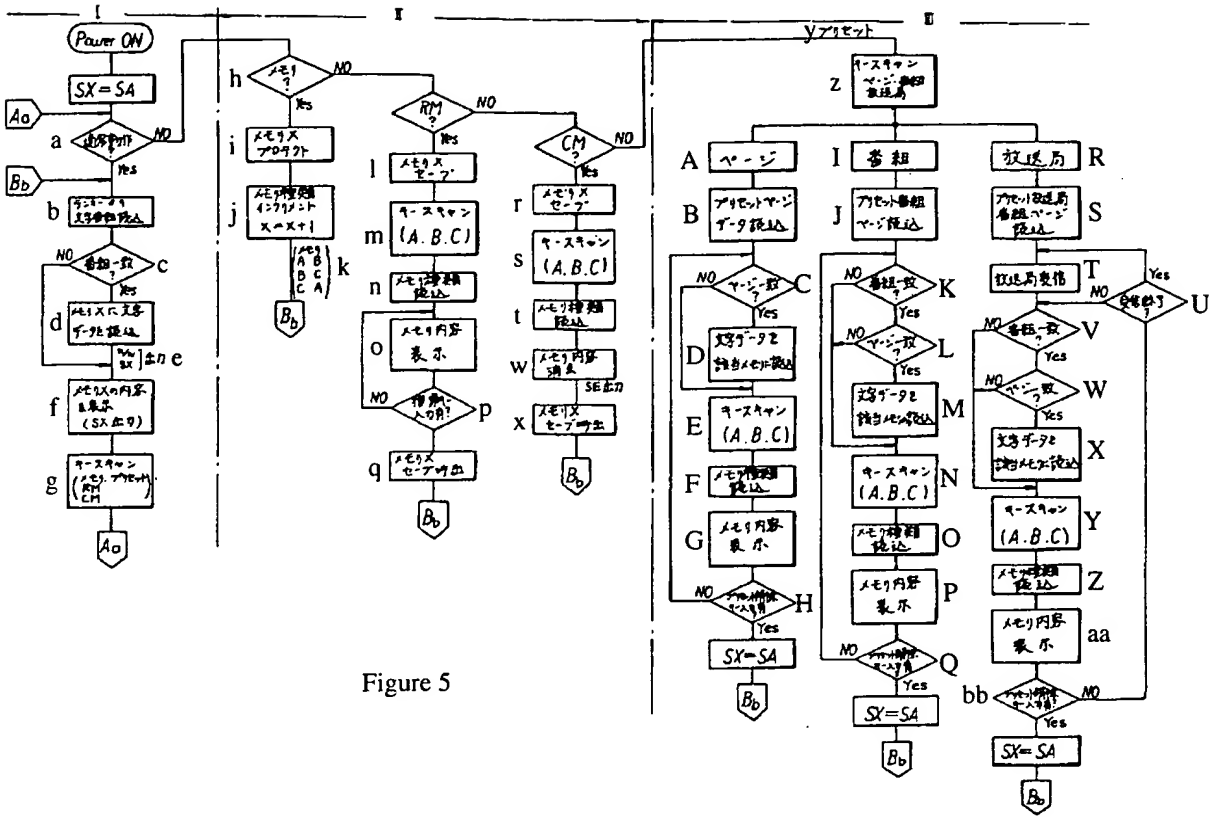

Figure 5

[captions]

a: Normal operation?
b: Read in character program from ten-key
c: Programs match?
d: Read character data into memory X
e: R/W, SX output
f: Display content of memory X (SX output)
g: Key scan (memory, preset); RM, CM
h: Memory?
i: Memory X protect
j: Memory type increment X = X + 1
k: Memory
A B
B C
C A
l: Memory X save
m: Key scan (A, B, C)
n: Memory type read
o: Display memory content
p: Return key input?
q: Memory X save call
r: Memory X save
s: Key scan (A, B, C)
t: Memory type read
w: Erase memory content
x: Memory X save call
y: Preset
z: Key scan: page, program, broadcast station
A: Page
B: Read in preset page data
C: Pages match
D: Read character data into corresponding memory
E: Key scan (A, B, C)
F: Memory type read
G: Display memory content
H: Preset cancel key input?
I: Program
J: Read in preset program page
K: Programs match?
L: Pages match?
M: Read character data into corresponding memory
N: Key scan (A, B, C)
O: Memory type read
P: Display memory content
Q: Preset cancel key input?
R: Broadcast station
S: Read in preset broadcast station, program, page
T: Receive broadcast station
U: Reception complete?
V: Programs match?
W: Pages match?
X: Read character data into corresponding memory
Y: Key scan (A, B, C)
Z: Memory type read
aa: Display memory content
bb: Preset cancel key input?

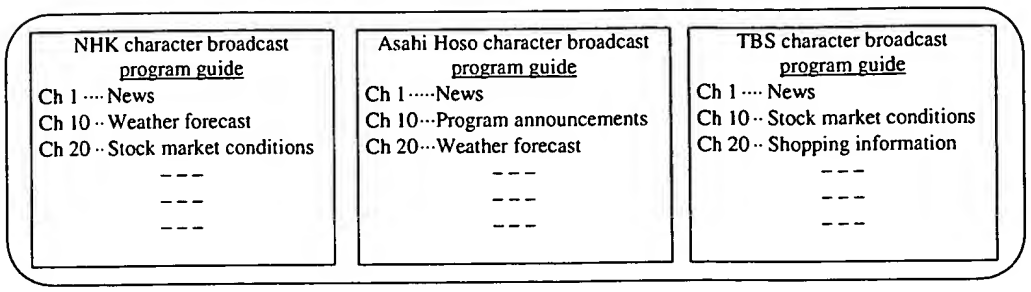

Figure 6

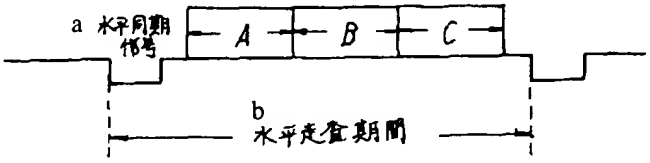

Figure 7

[captions]
a: Horizontal sync signal
b: Horizontal scan interval